FATIGUE OF SMALL REINFORCED CONCRETE BEAMS WITH END-ANCHORED REINFORCEMENT

by

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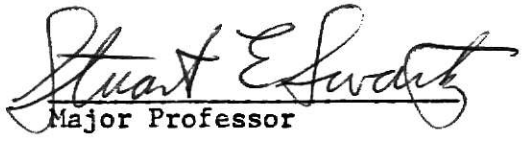

Major Professor

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CHAPTER I - INTRODUCTION

The utilization of reinforced concrete in structural applications continues to increase; for this reason many different kinds of studies have been done on this material.

In the area of fatigue studies on reinforced concrete relatively little work has been done in comparison to other areas of study.

This report describes experiments on reinforced concrete beams subjected to cyclic loads.

The main purposes of the research reported herein can be tabulated as follows:

1. Observe crack growth $\underline{V}$ cycles in specimens where bond failure and failure of steel reinforcing is prevented.

2. Observe the mode of failure in beams with different depth to span ratios.

3. Evaluate the effectiveness of the photoelastic coating technique to monitor cracking in concrete.

The tests were carried out on eight reinforced concrete beams of rectangular cross section.

The type of loading, length, shape of the cross section and type of reinforcing bar in all nine beams were the same, but the size of the reinforcing bars and the cross section were varied. These parameters appear to have a strong influence on the fatigue life of the concrete.

The following factors were considered for designing the beams:

1. Beams designed using cracked-section working stress theory.

2. The reinforcing was anchored with end plates so potential bond failure was not considered a parameter.

3. The maximum stress level in the steel was 1/3 to 1/2 f_y while the maximum stress level in the concrete was approximately 1/2 f'_c.

The methods, results and conclusions of past experiments on related topics have been reviewed and a summary is given in the next section.

The chapter on the testing program considers the design of specimens. A short discussion of the photoelastic coating technique, how it works, how the specimen's surface should be prepared and, in general, what needs to be done is also given in this chapter. This chapter also contains the test procedure, how to use the facilities and the important factors that need to be considered when operating the machine.

The information collected from the tests which describe the behavior of the beams under the cyclic loads is given in the chapter on experimental results.

Finally, a summary of this work with conclusions and design recommendations is given.